XLIV. *A Letter from Mr.* Franklin *to Mr.* Peter Collinſon, *F. R. S. concerning the Effects of* Lightning.

SIR, Philadelphia, June 20, 1751.

Read Nov. 14, 1751.

IN Captain Waddel's account * of the effects of lightning on his ſhip, I could not but take notice of the large *comazants* (as he calls them) that ſettled on the ſpintles at the top-maſt-heads, and burnt like very large torches before the ſtroke.

According to my opinion, the electrical fire was then drawing off, as by points, from the cloud; the largeneſs of the flame betokening the great quantity of electricity in the clouds. And had there been a good wire-communication from the ſpintle heads to the ſea, that could have conducted more freely than tarred ropes, or maſts of turpentine-wood, I imagine, there would either have been no ſtroke, or, if a ſtroke, the wire would have conducted it all into the ſea without damage to the ſhip.

His compaſſes loſt the virtue of the loadſtone, or the poles reverſed, the north point turning to the ſouth. By electricity we have here frequently given polarity to needles, and reverſed it at pleaſure. Mr. Wilſon tried it with too ſmall a force. A ſhock from four large glaſs jars, ſent thro' a fine ſewing needle, gives it polarity; and it will traverſe when laid on water.

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* Phil. Tranſ. N. 492, p. 111.

If the needle, when ſtruck, lies eaſt and weſt, the end enter'd by the electric blaſt points north.

If it lies north and ſouth, the end that lay towards the north, will continue to point north, when placed on water, whether the fire enter'd at that end, or the contrary end.

The polarity is given ſtrongeſt, when the needle is ſtruck lying north and ſouth; and weakeſt, when lying eaſt and weſt.

Perhaps if the force was ſtill greater, the ſouth end, enter'd by the fire, when the needle lies north and ſouth, might become the north; otherwiſe it puzzles us to account for the inverting of compaſſes by lightning; ſince their needles muſt always be found in that ſituation, and by our little experiment, whether the blaſt enter'd the north, and went out at the ſouth end of the needle, or the contrary, the end, that lay to the north, ſtill ſhould continue to point north. I have not yet had time to read and conſider Dr. Knight's *Eſſays*, juſt now received from you, which poſſibly may explain this.

In theſe experiments the ends of the needles are ſometimes finely blued, like a watch-ſpring, by the electric flame. This colour given by the flaſh from two jars only, will wipe off; but four will fix it, and frequently melt the needles. I ſend you ſome, that have had their heads and points melted off by our mimic lightning, and a pin, that had its point melted off, and ſome part of its head and neck run.

Sometimes the ſurface on the body of the needles is alſo run, and appears bliſter'd, when examined by a magnifying glaſs. The jars I make uſe of hold 7 or 8 gallons, and are coated and lined with tin-foil.

Each of them takes 1000 turns of a globe 9 inches diameter to charge it. I ſend you two ſpecimens of tin-foil melted between glaſs, by the force of two jars only.

I have not heard, that any of your European electricians have been able to fire gunpowder by the electric flame. We do it here in this manner:

A ſmall cartridge is fill'd with dry powder, hard rammed, ſo as to bruiſe ſome of the grains. Two pointed wires are then thruſt in, one at each end, the points approaching each other in the middle of the cartridge, till within the diſtance of half an inch: then the cartridge being placed in the circle, when the four jars are diſcharged, the electric flame leaping from the point of one wire to the point of the other, within the cartridge among the powder, fires it, and the exploſion of the powder is at the ſame inſtant with the crack of the diſcharge. I am,

S I R,

Your humble ſervant,

Benjamin Franklin.